would have given the same, and water was obtained within seven feet of the surface.

These two successes are the only instances mentioned for the Isle of Wight. We, however, can give four others, all of which were failures. Happening to be at Wootton we came across three other wells being dug under the advice of the diviner—whether the same person as operated at Woodside we do not know. We watched the sinking with great interest, for they were all in strata which a geologist could not advise sinking into, and consequently could seldom examine. Each of the wells was abandoned long before the first water-bearing stratum was reached. In fact, an additional depth of fully two hundred feet would be needed to reach the first spring, and then the supply would be but small and the water bad. A fourth site selected by the diviner was in chalk close to the sea. Some months afterwards a geologist was consulted, and he had to advise that nothing but salt water could be obtained there. The fact that a diviner had previously been consulted was only made known to the geologist by an accident. Thus, instead of the Isle of Wight yielding two successes and no failures, it yields four failures, one success—one that did not need a diviner, and one which, on the diviner's testimony alone, counts as a complete success.

This brings us to the principal criticism that we have to make on Prof. Barrett's collection of facts—that he does not give enough weight to the natural tendency of mankind to conceal their failures. A man making a bet or speculation is inclined to boast of it if it is a success. But if it fails, he usually prefers to hold his tongue. It is much the same with divining. It is perfectly natural that both the diviner and his employer should wish to keep the failure secret.

Though the bulk of the paper is taken up with hearsay evidence, we are given two fairly satisfactory test cases, which should be noted by any one who, on the strength of the numerous reports, is inclined to employ a diviner. One of the cases we allude to is the careful trial made in the adits at Richmond Waterworks, in Surrey. Two diviners were employed independently to locate the springs; with the result that they did not agree, and that when borings were made at the spots indicated, most of them were failures. In another case, Prof. Barrett himself tested the powers of a diviner, who was said to have been highly successful elsewhere in finding both water and ores. In Prof. Barrett's hands he failed completely, though an expert thought-reader might have had fair success. The diviner in this case seems to have been accompanied by persons having a complete knowledge of the position of all the springs, wells, and pipes which the dowser failed to find.

If scientific men still think it worth while to spend time on this investigation, we would suggest certain precautions which must be taken before any results can be accepted. Hearsay evidence, like the bulk of that brought forward, is valueless. When the skill of the dowser is tested, it must be at a place where surface indications will not help. Before boring or sinking the dowser's report must be put into writing, and no additions to his prophecy should afterwards be accepted. The operator should not be accompanied by any one who knows the position of the springs or pipes which he is set to find. His companion should be a stranger who can note the exact spots chosen, and write down at the time the exact nature of the diviner's forecast. The depth to the spring, amount of water expected, and continuous or temporary yield should all be noted. It should be carefully recorded whether the diviner predicts an open fissure, which can be tapped by boring, or advises a sunk well to collect a percolating supply. This last precaution is a very necessary one, for it constantly happens that a small boring, with an area of perhaps ten square inches, misses a fissure, or penetrates it at a spot where the walls come together. On the other hand, a sunk well would have a superficial area of some 4000 square inches, and consequently have a far better chance of obtaining water.

One of the most satisfactory tests would be to set the diviner to map out in some clay district the intricate network of water-pipes and drains of an unknown town. Or, if he prefers still water, to hide a number of bottles, some full and some empty, under a cloth or board, and let the dowser select the full ones without touching or seeing any of them. After shifting the bottles a few times this ought to give a sufficiently large number of tests to enable the percentage of failures to be calculated. But here again there must be no one in the room who knows the position of the bottles.

In conclusion, we must express our opinion that this investigation, undertaken at the request of the Council of the Society for Psychical Research, leaves the question in the same state as it found it. We feel that the accumulation of second-hand evidence is of little use, and that what is wanted is a few careful tests by perfectly qualified and unbiassed observers. The Richmond inquiry was good, but the failure is explained away by the statement that the dowsers employed were not in the first rank, and were young and inexperienced. Unfortunately all the most successful prophets seem to be dead.

NOTES.

THE American Geographical Society has guaranteed Lieut. Peary the sum of 150,000 dollars to meet the expenses of his proposed Arctic expedition. Lieut. Peary has obtained five years' leave of absence, and will start upon his journey about the end of next July. The large meteorite he succeeded in obtaining during the expedition which returned to St. John's, Newfoundland, towards the end of last month, weighs over seventy tons, and is to be placed in the New York Museum of Natural History.

IT is announced that Prof. Sanarelli, director of the Montevideo Institute of Experimental Hygiene, who recently discovered the bacillus of yellow fever, has now succeeded in preparing a curative serum. The details of the discovery will shortly be published.

Science states that Prof. Michael Foster will deliver several lectures in Baltimore in the course of this month, and will visit Boston later to deliver a course of lectures at the Lowell Institute.

DR. FRANK CLOWES has been appointed chemist to the London County Council, in succession to Mr. W. J. Dibdin, who recently resigned the post.

THE Agricultural Committee of the University College of North Wales, Bangor, has acquired a large farm in Anglesey, near Llangefni, for the purpose of providing practical courses of instruction in agriculture, together with field experiments. It is noteworthy that the same site had been previously used for agricultural work, conducted under the auspices of the college long before the present proposal was contemplated.

AT the meeting of the London County Council on Tuesday, the following resolution was adopted :—"That it be referred to the Parks and Open Spaces Committee and to the Technical Education Board to consider and report upon the practicability of laying out plots of ground in certain parks in such manner as will afford assistance to scholars of elementary and secondary schools in the study of practical botany."

THE opening meeting of the new session of the Royal Photographic Society was held on Tuesday evening, the Earl of Crawford, president, being in the chair. The proceedings commenced with the presentation of medals to the successful competitors in the Society's exhibition, the principal award being secured by Prof. Gabriel Lippmann (Paris) for specimens of colour photography by the interference method. The president afterwards delivered his annual address, the subject of which was "Weights and measures as they are used in photography." After suggesting what modification of present customs would best conduce to accuracy in result, facility of manipulation and computation, and increased volume of trade, he spoke of the origin and details of the metric system as applied to the science of photography, and contended that much might be done by the makers of photographic goods by giving metric dimensions to their cameras or plate-holders.

THE construction of the half-tide weir and lock across the river at Richmond has been so satisfactory in the results, and has added so much to the appearance of the river, that the inhabitants residing along he banks below this, and those interested in the boating, have for some time past been agitating for a similar weir and locks to be put across the river below Putney. The joint committee appointed by the several parishes in which this part of the river is situated have now obtained a report from an engineer advising that the site of the proposed weir should be situated about half a mile below Putney Bridge, and that the water should be held up to half-tide level. The width of the river at this point is nearly double that at Richmond, and consequently the cost of construction will be greater, the estimate being put at 250,000*l.* In a separate report made by another firm of engineers for the Wandsworth Vestry, the cost is put at 180,000*l.* It is stated that the proposed weir will not in any way interfere with the outfall of the drains and sewers which discharge into this part of the river, or clog the sub-soil drainage of the district.

THE annual "Fungus Foray" of the Essex Field Club will be held in Epping Forest on Saturday, October 16, under the botanical guidance of Dr. M. C. Cooke, Prof. Boulger, Mr. E. M. Holmes, Mr. G. Massee, and others. At the evening meeting at Warren Hill House, Loughton, Dr. Cooke will read a paper on "British Mycology during sixty years." Botanists wishing to attend should communicate with the hon. secretaries, Buckhurst Hill, Essex.

THE first meeting of the British Mycological Society was recently held at Worksop. On Tuesday, September 14, the woods on the Welbeck estate were explored, but little of note was found. In the evening Mr. George Massee delivered his presidential address on "Mycological progress during the past sixty years," after which he was unanimously re-elected president, and Mr. Carleton Rea hon. secretary and treasurer. During a visit to the demesne of Thoresby, an Entoloma, new to the British fungus flora, was discovered in Budby Wood, namely *E. hirtophyllum.* Other places in the district were explored, and some interesting specimens were obtained.

THE annual meeting of the Hull Scientific and Field Naturalists' Club was held on Wednesday evening, September 29; Dr. J. Hollingworth, the president, occupied the chair. The secretaries' report showed that great progress had been made during the year, and that the Club was in a very satisfactory condition. The reports for geology, botany, conchology, entomology, and ornithology testified that good work had been done during the year by the various sections. The botanists have been working out the flora of the East Riding, and have added a number of species to the Club's list of East Riding plants. The programme for the winter session 1897–98 includes lectures upon several very interesting scientific subjects.

A COMMITTEE, consisting of Sir F. Marindin (chairman), Earl Russell, Sir Douglas Galton, Sir C. Scotter, and Dr. J. S. Haldane, was appointed last February "to inquire into the existing system of ventilation of tunnels on the Metropolitan Railway, and report whether any, and, if so, what steps can be taken to add to its efficiency in the interest of the public." The report of the committee has just been issued in a Blue-book. That many portions of the Metropolitan Railway suffer from want of ventilation is well known. The committee draw attention to the amount of carbonic acid gas in the tunnel air, and to other impurities which arise from the emission of steam, and from the fuel consumed by the engines. After considering the suggested remedies of removing the impure air by fans placed midway between the stations, and the provision of additional openings, the creation of which were objected to by the local authorities on the grounds of public health and depreciation of property, the committee conclude by stating their conviction that pure air can be best obtained with certainty in these tunnels by means of electric working. In the words of the first of the conclusions of the committee, "By far the most satisfactory mode of ventilation of the Metropolitan tunnels would be by the adoption of electric traction."

PARTICULARS of the scientific work of the late Mr. William Archer, F.R.S., whose death we have already announced, are contributed to the October number of the *Irish Naturalist* by Dr. W. Frazer. Mr. Archer's special talent for patient investigations in connection with minute forms of vegetable and animal life was brought out by the Dublin Microscopical Club, which originated in 1849. In 1855 Mr. Archer prepared a list of Desmids obtained in Co. Dublin, illustrated with drawings, for the Zoological and Botanical Association of Trinity College, to which he afterwards added a supplemental list containing additional species. He edited for the second edition of Pritchard's work on Infusoria, the article "Desmidiaceæ," was the discoverer and describer of several new genera and families belonging to the Rhizopods, and published a special communication on *Ballia callitriche* in the *Transactions* of the Linnean Society. He was elected a member of the Royal Irish Academy in 1870, and subsequently served on its Council, and as Secretary for Foreign Correspondence from 1875 to 1880. In 1879 he was awarded the Cunningham Gold Medal. To the *Proceedings* of the Academy he contributed, in 1874, a paper on "Apothecia occurring in some Scytonematous and Sirosyphonaceous Algæ," and, in 1875, another on "*Chlamydomyxa labarynthuloides*, a new species and genus of Freshwater Sarcodic Organism." In June 1875, he was elected Fellow of the Royal Society, and in the following year he was appointed librarian to the Royal Dublin Society. When a large portion of the library of this Society was afterwards transferred to form the present National Library of Ireland, he took charge of the new building, and only retired from his office in 1895.

THE piers which have been constructed by the Tyne Commissioners at the mouth of the river, entirely out of dues paid by vessels entering the Tyne, have provided a convenient and much-needed harbour of refuge for this exposed and dangerous part of the North Sea. These piers, which have only been completed about a year ago, after occupying forty years in construction, are causing very serious anxiety to the Commissioners, the North Pier having for some time past shown signs of giving way, and all attempts to stop the undermining of the wall by the waves having failed. In January last, during a very heavy north-east gale, the sea made a clean breach through the wall at about two-thirds from the shore. Acting on the advice of the eminent engineers called in to report on the matter, it has been decided that it will be necessary to take down about 750 feet of the outer end of the North Pier, and reconstruct it on foundations carried to a greater depth below low water to the hard rock; the estimated cost of this work being over 300,000*l.*

THE difference of temperature between stations in a valley and upon a hill is one of considerable importance to agriculturists, and has occasionally engaged the attention of observers both in this country and abroad. The Agricultural School at Scandicci, near Florence, has made comparative observations during the whole of the year 1895 at two stations, one being situated in a plain, and the other about 220 feet higher, on the side of a hill, both having a north aspect, and the thermometers sheltered from rain and terrestrial radiation. The detailed observations and generalisations are published in the *Bollettino Mensile* of the Italian Meteorological Society for August last. The results are very interesting, and show that in the plain the minimum temperature is generally lower, while the maximum is higher than that on the hill; in other words, the plain is colder during the night and warmer during the day. The mean annual temperature in the plain was nearly 3° below that on the hill.

EUCLID's eleventh axiom has furnished material for discussion for many generations of mathematicians, and the latest contribution we have received in this direction is a series of short notes by Mr. Warren Holden, of Girard College, Philadelphia, beginning with a reprint from the *American Mathematical Monthly*, of an attempt to demonstrate the axiom, and including two separate proofs of the thirty-second proposition not involving the use of the term "parallel." Seeing that mathematicians have so fully investigated the geometry of non-Euclidian space, it need hardly be mentioned that Mr. Holden's proofs are based on alternative assumptions.

THE Stone Age of Phenicia has been elucidated by Prof. G. Zumoffen, and he has published his results in an illustrated paper in *l'Anthropologie* (viii., 1897, pp. 272, 426). Typical palæolithic implements have been found at seven stations. The forms known under the names of Chellian and Mousterian occur as well as other types. The Neolithic Age is characterised in Phenica, as everywhere else, by the presence of polished stone implements and coarse pottery. Four new stations have been discovered, in addition to the two found by Mr. Chester and described by Dawson in 1884.

THE decorative art of the Indians of the North Pacific Coast is the subject of a very instructive and well-illustrated paper by Dr. Franz Boas (*Bull. Am. Mus. Nat. Hist.*, New York, vol. ix. p. 123). The subjects are almost exclusively animals; each animal is characterised by certain symbols, and great latitude is allowed in the treatment of all features other than symbols. For example, the symbols of the beaver are large incisors, scaly tail, and a stick held in the fore-paws; of the hawk, a large curved beak, the point of which is turned backward so that it touches the face, &c. These symbols are often applied to human faces. It appears that the artist first tried to characterise the animals he intended to represent by emphasising their most prominent characteristics; these gradually became symbols, which were recognised even when not attached to the animal form. Dr. Boas very cleverly traces the distortions that result from the endeavour of the artist to adjust the animal to the decorative field in such a manner as to preserve as far as possible the whole animal and bring out its symbols most clearly, but without any idea of perspective. The representations are combinations of symbols of the various parts of the body of the animal, arranged in such a way that if possible the whole animal is brought into view. The arrangement, however, is so that the natural relation of the parts is preserved, being changed only by means of sections and distortions, but in such a manner that the natural contiguity of the parts is preserved. The success of the artist depends upon his cleverness in designing lines of dissection and methods of distortion. When he finds it impossible to represent the whole animal he confines himself to rearranging its most characteristic parts, always of course, including its symbols. There is a tendency to exaggerate the size of the symbols at the expense of other parts of the subject.

PROF. PENCK publishes in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin* an important contribution to the literature of the geology of the North-west Highlands of Scotland, from the standpoint of geomorphology. The author visited the region in question after the International Geographical Congress in 1895, and concentrated his attention chiefly on two points—the conditions under which the Torridonian sandstones were laid down, and the dynamical interpretation of the phenomena of the Ben More and Moine thrust-planes. The breccias lying immediately over the old gneiss are compared with formations observed by Dr. J. Walther in the peninsula of Sinai, and Prof. Penck suggests that the Torridon sandstones were laid down under climatic conditions similar to those now found in the latter region. From a minute discussion of the "experiments in mountain-building" of Cadell, Willis, and others, it is concluded that lateral thrust action only affects strata near the surface, but that in a typical case three different forms of displacement occur: simple sliding near the surface, a complex movement of sliding and dislocation below that, and a movement resembling the first in the lowest layers of all. These three stages in the formation of "fold"-mountain ranges are recognised as being at present exposed in the North German Plain, the Alps and Appalachian Mountains, particularly the Glarus Alps, and the north-west of Sutherlandshire, respectively.

THE idea that the many varieties of igneous rock found in a single district may have originated by differentiation from a single deep-seated rock-magma, is now familiar to geologists; but a more novel idea is suggested by Prof. Cole in a recent paper on "Slieve Gallion" (*Sci. Trans. Roy. Dublin Soc.*, vol. vi. part 9). He suggests that the fundamental earth-magmas may really be of extremely simple composition, and that the mineral complexity of plutonic rocks as we know them depends on the number of times an original magma has been remelted in a new environment, absorbing (or being absorbed) by substances of different composition. He is led to this conclusion by the phenomena of a granitic intrusion of Devonian age in the "Dalradian" schists of Slieve Gallion. The intrusive rock varies in composition from an aplite to a quartz-diorite, according to the surrounding material which it has partly absorbed as it intruded through it.

THE current number of the *Centralblatt für Bakteriologie*, Part ii., contains a paper by Messrs. Russell and Weinzirl on the rise and fall of bacteria in cheddar cheese. Determinations of the number of bacteria per gram in American cheddar cheese were made at different stages of the ripening process, whilst the varieties present were roughly classified under the heads of lactic acid bacteria, gas-producing bacteria, casein-digesting bacteria, and inert bacteria or those having apparently no effect on casein in milk cultures. In samples of green cheese examined immediately after it was removed from the press, a diminution in the numbers of bacteria present was noted as compared with the initial number present in the milk. This period of bacterial decline, however, generally lasts but two days, and is followed by a very marked increase in the numbers present later on, so much so that in the course of a few days, generally from eight to twenty, the germ contents may increase many-fold. This active bacterial growth is not by any means equally distributed amongst all the varieties of microbes present, but is almost exclusively confined to the lactic acid group of organisms, the gas-producing bacteria as well as the casein-dissolving varieties rapidly disappearing. The relation between this pronounced multiplication of the lactic acid bacteria and the ripening process in cheese is not yet exactly established, although the presumption is that these organisms are mainly responsible for these changes. This presumption is rendered more likely by the fact that Freudenreich, studying Emmenthaler or Swiss cheese, found the same coincidence between ripening and multiplication of lactic acid bacteria, and Lloyd, in his investigations of English cheddar cheese, arrived at the same result and came to a similar conclusion. The maximum period of bacterial development is followed by a period of final decline; in the course of time cheese may become sterile, although an examination of a hard dry skim cheese over two years old exhibited the presence still of a few lactic acid bacteria.

THE Clarendon Press has issued an "Account of the Herbarium of the University of Oxford," prepared by Prof. Vines, from the collection made by Gregory of Reggio in 1606 down to the present time. The herbarium includes, among others, the very interesting collection of British plants made by Dillenius to illustrate the third edition of Ray's *Synopsis*.

THE early publication is announced of a monograph of the British species of *Potamogeton* or pondweed, by Mr. Alfred Fryer, an acknowledged authority on the genus. It will be brought out by Messrs. L. Reeve and Co. in fifteen monthly parts, royal 4to, each with four plates, coloured or uncoloured, by Mr. Robert Morgan.

THE *Journal de Physique* for September contains papers by M. R. Swyngedauw on the dynamical and statical explosion-potentials of a condenser; by M. L. Décombe, on multiple resonance; by M. Michel Petrovitch, on a graphic method of integrating certain differential equations; by M. A. Gouy, on a heating-stove of constant temperature; and by M. Potier, on asynchronous motors.

THE *Kew Bulletin* for October contains an interesting correspondence between the authorities of Kew and those of the colony of Sierra Leone, on the economical value for trade purposes of the oil of the "butter and tallow tree" of Sierra Leone, *Pentadesma butyracea*, belonging to the Guttiferæ. Its application to the manufacture of soap is suggested. In this number is also a plan of the Botanic Garden at Freetown, Sierra Leone.

IN connection with the *Revue Semestrelle des publications mathématiques* it is proposed to issue an index supplement to the last five volumes (1893-1897). The subject-matter will be tabulated under four different headings, namely, an index of journals, a subject-matter index, a biographical index, and a list of authors. As the *Revue* is issued by the Mathematical Society of Amsterdam with the view of providing a summary of current mathematical literature, the present volume should prove a useful work of reference to specialists.

A SERIES of chapters on "The Great Meteoric Shower of November," which have been published in *The Observatory* from the pen of Mr. W. F. Denning, of Bristol, have been reprinted by Messrs. Taylor and Francis, and form a pamphlet of fifty-two pages. The work is illustrated, and contains a large collection of interesting facts with reference to the great shower of Leonids, so it will be useful to intending observers of the brilliant displays expected during the ensuing few years.

THE latest number of the *American Naturalist* is the first which has appeared under the new editors. Dr. Robert P. Bigelow, of Boston, is now the responsible editor, and, following the system under which *Science*, the *Astrophysical Journal* and other American periodicals are conducted, he is assisted by an editorial board consisting of a large number of associate editors. The place which it is hoped the journal will take is between the strictly technical serial and the general scientific newspaper. "Every scientific man, as such" (writes the editor), "may well read two general scientific journals—the weekly scientific newspaper and the monthly review of scientific progress." The *American Naturalist* will aim at providing investigators with the latter form of scientific information. Authors of papers intended for beginners, such as "Some Birds of the Garden," "Some Common Weeds," are politely informed that their contributions are not wanted, and very technical works of interest to only a limited number of specialists will be declined. What the editors desire is scientific papers written by scientific people and of interest to scientific workers in more than one field. The desire is a praiseworthy one, and we hope the fulfilment of it will exceed the editors' expectations.

THE following are among the papers and other publications which have recently come under our notice:—"P. J. van Beneden, La vie et l'œuvre d'un zoologiste," by Dr. Ad. Kemna (Antwerp: J. E. Buschmann). This biography of a great investigator, with an analysis of his contributions to science, and their bearing upon the progress of natural knowledge, is a publication the like of which is not often met with in this country. The account covers 135 pages, and forms a tangible testimony to a life of service to science.—A geological map of part of Trail Creek mining division, West Kootenay District, British Columbia, has just been published by the Geological Survey of Canada.—Part vi. of Mr. Oswin Lee's work, "Among British Birds in their Nesting Haunts" (Edinburgh: David Douglas) has been published. The ten plates contained in this new part of Mr. Lee's attractive work illustrate nests of the heron, crossbill, kestrel, wheatear, whitethroat, and solan goose.—"On the Nature of the Röntgen Rays," by Sir G. G. Stokes, F.R.S. This—the first Wilde Lecture of the Manchester Literary and Philosophical Society—was delivered on July 2, and appears in the latest number of the Memoirs and Proceedings of the Society (vol. 41, part iv.).—"Recent Advances in the Science of Hygiene," an address delivered to the Haslemere and District Sanitary Aid Association, by the Hon. Rollo Russell (London: Economic Printing and Publishing Company).

A PAPER, by Prof. G. Linck, on the relations between the geometric constants of a crystal and the molecular weight of its substance (*Zeitschrift für Krystallographie*, vol. xxvi.) is summarised in the October number of the *American Journal of Science*. It is pointed out in the abstract that Prof. Linck has already called attention to the fact that the characteristics of crystals, that is, their geometric and optical constants, stand in direct relation to the atomic or molecular weight of the elements contained in them. This is most clearly shown in the eutropic series: a eutropic series being defined as a series of substances, crystallising similarly, but differing, only in that they each contain a different element, though the elements are yet similar according to the periodic system of Mendeléeff. If such a series is arranged according to increasing molecular or atomic weight, then the series, for all characteristics of the crystal, remains unchanged. The fundamental law of these phenomena the author has designated "Eutropy." For the present investigation it was necessary to know the system to which the crystal belonged, its axial relations, the specific gravity and the atomic weight. Tables computed from these data lead to the following conclusions: (1) The actual volumes of the various chemical compounds, if formed into equivalent crystals, stand in a very simple relation to each other. (2) The weights of these equivalent volumes stand in the same relations to each other as the molecular weights. (3) The volumes in a eutropic series increase with increasing molecular or atomic weights. (4) The weights of equivalent volumes always increase with increasing atomic weights. (5) Bodies which are isomorphous but not eutropic likewise stand in a very simple relation to each other according to their crystal volume or their actual volume as the case may be. (6) Many crystals which have heretofore been considered eutropic or isomorphic are not so, since they probably possess a larger or smaller molecular weight according to the number of atoms.

THE additions to the Zoological Society's Gardens during the past week include a Common Marmoset (*Hapale jacchus*) from South-east Brazil, presented by Mrs. A. H. Browne; a Crowned Duiker-Bok (*Cephalophus coronatus*, ♂) from West Africa, presented by Mr. A. Nightingale; a Nightjar (*Caprimulgus europæus*), British, presented by Mr. Richard Catter; a Dusky Parrot (*Pionus fuscus*) from Guiana, presented by Mr. F. Scammell; a Scarlet Snake (*Cemophora coccinea*), an American Black Snake (*Zamenis constrictor*), two Testaceous Snakes (*Zamenis flagelliformis*), a Mexican Snake (*Coluber melanoleucus*), a Hog-nosed Snake (*Heterodon platyrhinos*), a King Snake (*Coronella getula*) from Florida, presented by Mr. J. H. Fleming; a Sœmmerring's Gazelle (*Gazella sœmmerringi*, ♂), a Striped Hyæna (*Hyæna striata*) from Egypt, deposited; a Golden Plover (*Charadrius pluvialis*), a Grey Plover (*Squatarola helvetica*), a Ringed Plover (*Ægialitis hiaticula*), a Bar-tailed Godwit (*Limosa lapponica*), British, an Eyra (*Felis eyra*) from South America, purchased.

OUR ASTRONOMICAL COLUMN.

CONJUNCTION OF VENUS AND JUPITER.—These brilliant planets may now be observed near together in the morning sky, and are rapidly approaching each other. Conjunction will occur on October 19 at 9h., when Venus will be only 0° 28′ N. of Jupiter, but they will be below our horizon. As a spectacle for the naked eye the varying positions of the two objects will be very interesting at about this period. Their times of rising and distances from each other on several mornings will be as follows:—

Date.		Venus rises.		Jupiter rises.		Approx. distance.		Sun rises.
		h. m.		h. m.		°		h. m.
Oct. 16	...	3 37 a.m.	...	3 59 a.m.	...	4	...	6 27
,, 17	...	3 40 ,,	...	3 56 ,,	...	3	...	6 28
,, 18	...	3 43 ,,	...	3 54 ,,	...	2	...	6 30
,, 19	...	3 46 ,,	...	3 51 ,,	...	1	...	6 31
,, 20	...	3 49 ,,	...	3 48 ,,	...	¾	...	6 32
,, 21	...	3 52 ,,	...	3 45 ,,	...	1½	...	6 34
,, 22	...	3 55 ,,	...	3 42 ,,	...	2¼	...	6 36
,, 23	...	3 58 ,,	...	3 40 ,,	...	3¼	...	6 38
,, 24	...	4 1 ,,	...	3 37 ,,	...	4¼	...	6 40

The star η Virginis (mag. 4·1) will be about 5° E. of the two planets on October 20. Venus will pass 0° 15′ N. of the star on October 23, while Jupiter will pass 0° 15′ S. of it on November 15. On the morning of October 24 the waning crescent of the moon will be about 7° S. of Venus, and a similar distance S.E. of Jupiter.

Conjunctions of Venus and Jupiter are not separated by a constant interval, but occur once at an interval of about 304 days, and then twice at intervals of about 443 days, as the following table of twelve conjunctions ending with that of October 29, 1899, will show. But this sequence is not invariable, for in the years 1861, 1862, and 1863 and 1882, 1883, and 1884, three successive conjunctions occurred at the interval of about 443 days.

Date of conjunction.		G.M.T.		Relative positions.		Interval in days.
		h.		° ′		
1888 January 2	...	4	...	♀ 1 51 N.	...	—
1888 November 1	...	9	...	1 31 S.	...	304
1890 January 18	...	21	...	0 26 S.	...	443
1891 April 7	...	9	...	0 13 N.	...	444
1892 February 5	...	22	...	0 1 S.	...	304
1893 April 28	...	17	...	0 4 N.	...	448
1894 July 19	...	20	...	0 51 S.	...	448
1895 May 18	...	4	...	2 5 N.	...	303
1896 August 2	...	11	...	0 40 N.	...	442
1897 October 19	...	9	...	0 28 N.	...	443
1898 August 19	...	6	...	1 51 S.	...	304
1899 October 29	...	13	...	♀ 0 33 S.	...	436

On October 21 next, at about 6·45 a.m. the relic of the great red spot, if still visible, will be presented nearly on the central meridian of Jupiter, and if the weather is clear, an excellent opportunity will thus be offered for securing an early observation of this remarkable feature

THE LEVEL OF SUNSPOTS.—Prof. H. Riccò brings together some statistics in reply to the recent discussions relating to the question of "Are sunspots cavities or not?" (*Astrophysical Journal* for August). The observations discussed were derived from a series of drawings of sunspots made by the method of projection in the years 1880 to 1890 at Palermo with a refractor of 0·25m. aperture, and at Catania with a refractor of 0·33m. aperture. The projected image was in all cases 0·57m., a size sufficient to satisfactorily show the principal details of the spots. The result of the discussion, as will be seen from the following figures, shows that the number of spots near the limb, whose projected form gave a result conforming to the theory of Wilson, greatly exceeds the number of contrary or uncertain cases. The facts show that from the years 1881 to 1892 the proportion of cases favourable, unfavourable, and neutral, were in the proportion of 7·3 to 1 to 2. If greater weight be given, as Prof. Riccò says, to spots near the sun's limb, the penumbra of which conforming to the appearance of a cavity seen in perspective is invisible on the side opposite the limb, "I have found twenty-three cases of this sort in the eleven years, and only one contradictory case." Prof. Riccò acknowledges the importance of the problem of the constitution of sunspots and the difficulties involved, and advocates Mr. Evershed's suggestion that the radiations of sunspots should be studied in a more complete manner.

THE ORBIT OF COMET 1822 IV.—On July 13, 1822, Pons, at Marlia, near Lucca, in Italy, discovered a comet which, two months later, reached its maximum brightness, developing about this time a stellar nucleus of the ninth or tenth magnitude. The observations extended over a period of several weeks, and the most satisfactory elements computed were obtained from the investigation carried out by Encke. A new and interesting computation of the elements of this comet has been undertaken by Dr. A. Stichtenoth (*Untersuchung über die Bahn des Cometen* 1822 IV., Leipzig, 1897, W. Engelmann) in his Doctor's dissertation presented before the Göttingen faculty. These new elements, which are not found to differ very much from those obtained by Encke, depend on 456 observations, which for the most part have been reduced directly from the original observations. Referred to the ecliptic they are as follows:—

$$T = 1822 \text{ October } 23{\cdot}772734, \text{ Paris M.T.}$$

$$\text{Log } q = 0{\cdot}0588426$$

$$\left.\begin{array}{lrrr} & \circ & \prime & \prime\prime \\ \Omega = & 92 & 44 & 23{\cdot}01 \\ i = & 127 & 20 & 47{\cdot}95 \\ \omega = & 181 & 4 & 38\,08 \end{array}\right\} 1822{\cdot}0.$$

$$e = 0{\cdot}9963021$$

The investigation tells us that the period of revolution corresponding to the above value of the eccentricity, namely 0·9963021, amounts to 5449·0 years; but on account of the length of the elliptical orbit, this value of the eccentricity can be varied considerably without in any way interfering with the calculated positions: thus the period of revolution may be said to lie between 4504 and 8748 years.

A point of additional importance and of considerable interest which this new discussion of the observations discloses, is that an examination of the original manuscripts of Gambart and Olbers shows that the appearance of this comet was somewhat analogous to that of Comet Holmes. Gambart observed, namely on 1822 July 26, a sudden brightening of a stellar-like condensation in the nucleus, which at the beginning of August had completely disappeared. On September 20 and 21 Olbers observed a similar increase in brightness, but the decrease took place more slowly than in the previous case. It appears, therefore, that sudden variations in the brightness of the cometary matter which occurred in this comet were similar to those which were recently noticed (1893 January 16) in Comet Holmes, and can be easily explained on the meteoritic hypothesis.

The above interesting fact, connected with this nearly forgotten comet, adds an extra feature to this most thorough and complete "Arbeit," and Dr. Stichtenoth is to be congratulated on bringing his computation to such a successful issue.